

**In the Claims:**

Please cancel claims 13, 14, 18, 19, and 21-44 without prejudice.

The following lists all claims and their status:

1. (Original): A method for designing a coil, comprising:

selecting a geometry for the coil;

selecting a region of interest for a magnetic field produced by the coil;

defining a stream function for the current density distribution of the coil, wherein the stream function is a sum of sinusoidal functions, wherein each sinusoidal function comprises an amplitude; and

numerically optimizing the amplitudes of the sinusoidal functions to produce a magnetic field of selected characteristics in the region of interest.

2. (Original): The method of claim 1, wherein the stream function is defined as follows:

$$S(x, y) = \sum_i A_i \sin\left(\frac{i\pi x}{a}\right) \cdot \sum_j B_j \sin\left(\frac{j\pi y}{b}\right) / (i \cdot j)$$

where  $A_i$  and  $B_j$  are Fourier coefficients representing the amplitudes of the sinusoidal functions in the x and y directions, respectively, and  $a$  and  $b$  are dimensions of the coil in the x and y directions, respectively.

3. (Original): The method of claim 1, wherein numerically optimizing the amplitudes of the sinusoidal functions comprises:

selecting an amplitude for each of the sinusoidal functions;

generating a plurality of current loops from the stream function for the selected geometry;

dividing the current loops into a plurality of elements;

calculating the magnetic field produced by the plurality of elements at a plurality of points in the region of interest; and

evaluating an error function based on the magnetic field at the plurality of points.

4. (Original): The method of claim 1, wherein numerically optimizing the current density comprises simulated annealing.
5. (Original): The method of claim 1, wherein the selected geometry for the coil comprises an open geometry.
6. (Original): The method of claim 1, wherein the selected geometry for the coil comprises a substantially half cylindrical shell.
7. (Original): The method of claim 1, wherein the coil comprises a gradient coil, wherein the selected characteristics comprise homogeneity of a gradient in a longitudinal direction relative to a main magnetic field.
8. (Original): The method of claim 1, wherein the coil comprises a gradient coil, wherein the selected characteristics comprise homogeneity of a gradient in a transverse direction relative to a main magnetic field.
9. (Original): The method of claim 1, further comprising modeling the selected geometry

for the coil a three-dimensional modeling program.

10. (Original): The method of claim 1, wherein the amplitudes of the sinusoidal functions are controlled to produce a symmetric coil.

11. (Original): The method of claim 1, wherein the amplitudes of the sinusoidal functions are controlled to produce an asymmetric coil.

12. (Original): A coil designed using the method of claim 1.

Claims 13-14 (Cancelled).

15. (Original): A method of designing a coil comprising:

selecting an open geometry for the coil;

selecting a region of interest for a field produced by the coil;

defining a current density distribution for the coil; and

numerically optimizing the current density distribution to produce a field of selected characteristics in the region of interest.

16. (Original): The method of claim 15, wherein the selected geometry comprises a substantially half cylindrical shell.

17. (Original): The method of claim 15, wherein numerically optimizing the current density comprises simulated annealing.

Claims 18-19 (Cancelled).

20. (Original): The method of claim 15, further comprising modeling the selected geometry for the coil a three-dimensional modeling program.

Claims 21-44 (Cancelled).

45. (New): A coil comprising an open geometry and configured to produce a magnetic field of selected characteristics in a region of interest, wherein at least one of the selected characteristics of the magnetic field is produced by numerically optimizing amplitudes of a plurality of sinusoidal functions.

46. (New): The coil of claim 45, wherein a sum of the plurality of sinusoidal functions comprises a stream function for the current density distribution of the coil.

47. (New): The coil of claim 45, wherein a sum of the plurality of sinusoidal functions comprises a stream function for the current density distribution of the coil, wherein the stream function is defined as follows:

$$S(x, y) = \sum_i A_i \sin\left(\frac{i \cdot \pi x}{a}\right) \cdot \sum_j B_j \sin\left(\frac{j \cdot \pi y}{b}\right) / (i \cdot j)$$

where  $A_i$  and  $B_j$  are Fourier coefficients representing the amplitudes of the sinusoidal functions in the x and y directions, respectively, and  $a$  and  $b$  are dimensions of the coil in the x and y directions, respectively.

48. (New): The coil of claim 45, wherein the coil is configurable for use in magnetic resonance imaging.

49. (New): The coil of claim 45, wherein the coil is configurable for use in transcranial magnetic stimulation.